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Disease-a-Month

Postcholecystectomy Syndrome

GORDON McHARDY

THE YEAR BOOK PUBLISHERS • INC.
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Disease-a-Month Series

MONTHLY CLINICAL MONOGRAPHS ON CURRENT MEDICAL PROBLEMS

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Postcholecystectomy Syndrome

GORDON McHARDY

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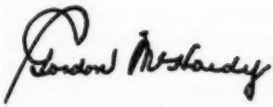

is a graduate of Tulane University School of Medicine. After initial ventures into pathology, his postgraduate training continued in internal medicine at the University of Rochester, Strong Memorial Hospital, Tulane University and Touro Infirmary. As Clinical Professor of Medicine at Louisiana State University, his interest in graduate and postgraduate teaching has centered on gastroenterology. His principal contributions to the medical literature have been in this field, with his most recent effort indicated by his editorial participation in the publication of the *Proceedings of the World Congress of Gastroenterology* in 1958. He has published more than 100 scientific articles on gastroenterologic subjects and is an officer of the Governing Board of the American Gastroenterological Association and Secretary of the Section on Gastroenterology and Proctology of the American Medical Association.

THE TERM "postcholecystectomy syndrome" came into prominence with successful cholecystectomy, although a reasonable number of the clinical pictures encountered under this classification probably should be traced to the first cholecystotomy, accredited to Bobbs in 1868. The first cholecystectomy was probably performed by Langenbeck in 1882. Concomitant with progress in surgery of the biliary tract came the almost inevitable broadening of the indications for removal of the gallbladder. The diagnostic cholecystogram, introduced in 1926, permitted more elective biliary procedures. As a consequence of anticipated occurrence of untoward results of, and lack of improvement from, indicated cholecystectomy, the term postcholecystectomy syndrome was coined to include the variety of manifestations that was thus created.

The implication is that this entity is surgically created; i.e., it is an unsatisfactory operative result. This may often be true. Whereas the operative technic of cholecystectomy is admittedly standardized,

the margin of safety is small and biliary abnormalities and complications may render what is considered a simple procedure extremely involved, so that more than ordinary surgical skill and judgment are required. Clinical evaluation, diagnostic accuracy, technical surgical ability and knowledge of surgical anatomy should be considered contributing factors in such cases. Definitive, properly indicated and successfully performed operation with restoration of disturbed biliary circulation and excretion unquestionably results in well-being in many persons chronically disabled by disease of the biliary tract. However, improper, inadequately or not specifically indicated operative procedures, surgical mishaps and limitations can—and too often do—terminate in profound temporary or protracted morbidity, and in some instances, chronic debility. Obviously, therefore, the postcholecystectomy syndrome, in its composite pathogenesis, may often be an indictment of both internist and surgeon (43). Unfortunately, there will be occasions, even if both have ably performed their assignments, when persistence or creation of that group of ill-defined manifestations that are encompassed by the syndrome nullifies the benefits of a justified procedure. Pre-existent associated malfunctions not amenable to biliary surgery, physiologic and mechanical disturbances inherent in the operative procedure and mishaps potential to any involved technical procedure are among the unavoidable factors.

In a statistical survey, Sherlock (36) estimated the incidence of occurrence of this complication to range from 17 to 33%. In a follow-up review of 520 patients who had cholecystectomy on our gastrointestinal service, only 39 patients were rehospitalized for postcholecystectomy difficulties; this represents an incidence of 7.5%, but, obviously, many milder cases not requiring hospitalization were overlooked.

Postcholecystectomy syndrome, a misnomer, is properly described as the persistence, recurrence or occurrence after cholecystectomy of dyspeptic manifestations, most often painful and referable to the biliary tract with or without obstruction or inflammation of the common duct. Berk (1) has simply defined this syndrome as "a term of reference to the situation in patients with symptoms after cholecystectomy." Others have titled their concept of the entity as biliary dyskinesia (15), biliary dyssynergia, cystic duct remnant (13, 15), cystic duct stump (11), re-formed gallbladder (2, 28), recurrent biliary tract syndrome, traumatic or amputation neuroma (12), residual, retained or re-formed choledochal stones (17), residual

hepatitis, cholangitis, postoperative bile duct stricture (7), stenosis of the sphincter of Oddi (6) and pancreatitis. This discussion necessarily extends beyond the scope of difficulties that can be described by the simple term, biliary dyskinesia.

CLASSIFICATION

A number of distinct entities, a variety of etiologic factors and divergent pathophysiologic changes are under consideration. Each requires meticulous diagnostic evaluation and intricate and ingenious surgical correction supported by analytic and intelligent medical management. With the introduction of progressively more satisfactory cholecystographic media for oral administration (Priodax®, Telepaque®, Orabilex®) and operative cholangiographic substances (Diodrast®, Hypaque®), and the adequacy of intravenous cholangiography (Cholografin®, Duografin®) aided by opiate-induced oddal spasm and cholecystokinetically produced relaxation, our understanding of the foregoing enumerated occurrences now permits more satisfactory classification by pathogenesis modifying the encompassing term. I prefer division of these entities in relation to the characteristics of their occurrence and suggest the following classification:

I. *Persistent precholecystectomy manifestations.* –

a) Diagnostic error—cholecystectomy performed when manifestations resulted from concomitant disease or were of functional origin

b) Surgical failure or limitation in relief of such choledochal obstructive manifestations as pain, jaundice and cholangitis

II. *Recurrent precholecystectomy manifestations.* – Early return of obstructive pain, jaundice or cholangitis because the surgical procedure incompletely or only temporarily relieved the source of choledochal obstruction

III. *True postcholecystectomy syndrome.*—New symptoms recognized in:

a) Delayed recurrence of precholecystectomy manifestations related to choledochal obstruction, the result of such postoperative developments as:

1. Cholangitis
2. Stone re-formation from fragment nidus
3. Pancreatitis

b) Postprandial dyspeptic complaints related to faulty fat digestion, upper abdominal discomfort and pain with or without nausea and vomiting

c) Biliary dyskinesia or dyssynergia

d) Surgically created situations or oversights related to:

1. Cystic duct remnant
2. Gallbladder remnant
3. Stenosing choledochitis
4. Traumatic lesions: fistula (internal and external) formation, choledochal section or ligation

e) Pancreatitis (traumatic)

f) Biliary cirrhosis

g) Carcinoma

1. Pancreas
2. Ampulla of Vater
3. Common duct

h) Pericholedochal or periantroduodenal adhesions

i) Traumatic or amputation neuroma

j) Retained, residual or missed calculi

A survey of our combined medical and surgical services (1938–58) of cases classified under these three types of postcholecystectomy syndrome revealed patients who had been treated by the general practitioner and general surgeon, on university teaching services and in private and public hospital wards.

The length of postoperative observation of the patient may appreciably alter the situation. Although most patients are recognized as having poor operative results within early months, many do not experience significant difficulty for years. Most of the complications in our experience were seen within 90 days postoperatively, but some were not recorded until an average of 12 months. In a reasonable number of patients, difficulty postdated the operation by 20 months. There were even instances with an asymptomatic period of as long as 10 years after cholecystectomy.

The distribution of 147 cases of postcholecystectomy syndrome in the present series is shown in Table 1. Causal analysis of this group of cases (Table 2) led to the following conclusions:

TABLE 1.—Distribution of 147 Cases of Postcholecystectomy Syndrome According to Cause

Manifestations	Diagnostic Error		Associated Biliary Disease		Surgical Failure		Total	
	Cases	%	Cases	%	Cases	%	Cases	%
Persistent precholecystectomy	43	57.4	20	26.6	12	16	75	51.2
Early recurrent precholecystectomy	9	30.0	12	42.0	8	27	29	19.8
True postcholecystectomy	4	29.0	9	20.9	30	69.7	43	29
Total	56	38.1	41	27.9	50	34	147	100

TABLE 2.—Analysis of 147 Cases of Postcholecystectomy Syndrome

Cause						Final Diagnosis								Type of Management			
						Nonbiliary (43–29.5%)				Biliary (104–70.5%)							
Diagnostic Error		Associated Biliary Disease		Surgical Failure		Functional		Organic		Physiologic		Mechanical		Reoperation		Medical	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
56	38.1	41	27.9	50	34.0	29	67.4	14	32.6	34	32.7	70	67.3	78	53.4	68	46.6

DIAGNOSTIC ERROR (56 cases, 38.1%).—If doubt renders exploratory laparotomy essential to a definitive diagnosis, this should be the justification for operation, rather than "gallbladder disease" with only vague symptoms at times committing an operator to excisive decisiveness. Erroneous diagnostic analysis, in that either there was no significant cholecystic disease or the existing gallbladder abnormality was not responsible for the entire clinical picture for which cholecystectomy was performed, existed in more than one third of our cases. It is of interest and importance that into this category fell the largest group of persistent precholecystectomy manifestations but the fewest of those classified as true postcholecystectomy syndrome.

In the "persistent" category were primarily those patients with functional dyspeptic complaints. Many had had a previous operation (appendectomy) for the same symptoms; in most of these patients, no organic disease referable to the biliary tract could be found. A significant number, however, had organic disease other than that of the biliary tract which might have explained their symptoms, such as, peptic ulcer, esophageal hiatal hernia, gastric carcinoma, arthritis of the dorsal spine, coronary heart disease and esophageal achalasia.

Early recurrent symptoms as the result of diagnostic error occurred in the smallest percentage of patients in the series. There were fewer patients with no organic disease. In 2 patients, the esophagitis of hiatal hernia remained quiescent for several weeks postoperatively, and apparently the rest period gave temporary relief in 2 patients with duodenal and in 1 with channel ulcer. All 3 patients later experienced complications requiring definitive surgical treatment.

Despite thorough and astute preoperative diagnostic survey, in a certain number of patients a presumptive preoperative diagnosis of cholecystitis with or without cholelithiasis will be made. At operation should the nonoffending gallbladder be removed to justify the diagnostic error? Apparently, patients with peptic ulcers do poorly after cholecystectomy. Removal of a functioning gallbladder may often precipitate mechanism disturbances simulating dyskinesia (25, 27).

ASSOCIATED BILIARY DISEASE (41 cases, 27.9%).—Incomplete diagnosis should probably be classified as a diagnostic error. These patients were grouped categorically as those with associated disease (the significance of which was overlooked), while acute or chronic cholecystitis with or without cholelithiasis existed as the true sur-

gical indication. The cholecystic symptoms were relieved, but biliary disease that was causal, concomitant or the result of the cholecystic disease persisted, recurred or followed operation to impair the surgical achievement.

The liver and pancreas were considered as biliary because of their common excretory pathways. There were 17 instances each of hepatic and pancreatic disease and 7 instances of patients with choledochal difficulty. Histologically established hepatic disease included pigment or biliary cirrhosis, the result of prolonged extrahepatic obstruction in 3, portal cirrhosis in 8 and severe hepatic fatty infiltration in 6.

In the pancreatic category, 7 patients had acute pancreatic edema (3 with jaundice) associated with acute cholecystitis. Four patients had recurrent pancreatitis with intermittent steatorrhea, associated with symptomatic cholelithiasis. Calcareous pancreatitis was manifested by pain alone in 2 and by pain with diabetes and pain with steatorrhea in 1 each. In 2 patients, ulcer perforating into the pancreas explained recurrent hyperbilirubinemic pain.

Choledochal difficulty, the associated biliary disease in 7 instances, was accounted for by 5 occurrences of inflammatory or traumatic choledochitis and 2 of fibrosis at the terminal choledochus or sphincter of Oddi.

Persistency (in 20 patients) represented almost half the cases in this category (48.7%). The 13 hepatic concomitants—biliary cirrhosis with jaundice (2 cases), portal cirrhosis (8 cases) and fatty infiltration (3 cases)—were persistent after removal of a calculous gallbladder. During a follow-up period the jaundice gradually subsided in 1 patient with biliary cirrhosis and the fatty changes disappeared on biopsy.

Pancreatitis as an acute edematous phase after removal of an acutely inflamed gallbladder persisted for an average of 8 weeks postoperatively in 3 cases. The 4 patients with calcareous pancreatitis were not benefited by gallbladder surgery.

Early recurrence after initial histologic clearance of fatty changes on hepatic biopsy was noted in 2 patients with concomitant hepatic tenderness and anorexia, which were also present before operation. Recurrent pancreatitis with pain and steatorrhea held true to its name despite removal of a calculous gallbladder that was hoped would be the etiologic factor. Four of the conditions interpreted as acute edematous pancreatitis at cholecystectomy recurred postoperatively. Two patients with hyperbilirubinemia which resulted from ulcer perforating into the pancreas improved for a period after

cholecystectomy, but recurrence required more definitive surgical treatment later.

In most patients with associated biliary disease on whom cholecystectomy is done for cholecystic disease, that operation alone does not alter the associated biliary disease.

SURGICAL FAILURE (50 cases, 34%).—Surgical failure contributed to development of true postcholecystectomy syndrome in 69.7% of the patients; from such figures is derived the title for this composite clinical entity. In most of these cases there was a reasonable explanation for the complication and operation was justifiable.

In all 50 cases the complication could be attributed to incomplete or unsuccessful operation. Residual choledochal calculi in 12 cases, palliative cholecystostomy in 4, cystic duct remnant in 9 and gallbladder remnant in 4 represent surgical limitation. Fibrosis or stricture of the terminal choledochus or sphincter of Oddi in 5 cases, chronic pancreatitis with partial choledochal compression in 3, choledochal malignant lesion in 1 and pancreatic carcinoma in 4 should be considered surgical oversights. Stenosing choledochitis (1 case), pericholedochal adhesions (2 cases), traumatic neuroma (1 case), fistula formation (2 cases), traumatic pancreatitis (1 case) and periantroduodenal adhesions (1 case), comprise a pardonable balance.

Significant pericholedochal and antroduodenal adhesions may, respectively, create choledochal angulation and duodenal ileus. These are neither established nor frequent contributors to postcholecystectomy syndrome.

Physiologic derangements, wherein a period must transpire for the digestive system to readjust to the loss of bile reservoir and of hormonal (cholecystokinin) stimulation which apparently normally activates the reciprocal mechanism of gallbladder contraction and sphincter of Oddi relaxation, cause either morphine-reproducible sphincteric spasm or digestive disturbances that persist for a variable postoperative period. These disturbances appear to be minimal and brief when a chronically nonfunctioning gallbladder is removed, but more severe and more protracted when the acute nonfunctioning or functioning gallbladder is removed. Dyskinetic pain or that due to in-co-ordination of ductal motility has been rarely encountered in our patients in whom a chronically nonfunctioning gallbladder was removed. To functional derangement alone, Sherlock (36) applies the term "postcholecystectomy syndrome."

Choledochostomy drainage, regardless of the length of the T-tube

limbs, is frequently complicated by the regurgitation of duodenal content with peptic activity into the common duct. The importance of this observation in the course of our recent study of choledochal bile is yet undetermined, but the probable relationship to choledochitis and stricture formation is hypothesized (24).

DIAGNOSIS

In the assessment of biliary symptoms in postcholecystectomy patients, analysis of the history and present illness, physical examination, laboratory survey and radiologic observations must be meticulous. Our experience, like that of others, admits the three distinct possibilities, with an overlap of two or all three of these potentials in some instances: diagnostic error, associated biliary disease or surgical failure.

History

The astute clinician can often, from the symptoms, establish the relationship of the patient's complaints to cholecystectomy. In many instances this analysis will reveal that the symptoms that antedated cholecystectomy are now classified as a postcholecystectomy syndrome, whereas their only relationship to the surgical procedure was a demarcation of before and after. Was the "typical" clinical picture of biliary disease substantially proved to be the cause of the syndrome for which cholecystectomy was performed? In the survey, were associated or contributing factors evaluated? This type of hindsight is often revealing. However, if the manifestations are distinctly new or altered after operation, it is more logical to assume a causal relationship of surgical failure, incompleteness, accident or concomitant disease in neighborhood organs.

The manifestations true to a postcholecystectomy syndrome should be classified in relation to their presentation:

1. *Biliary dyspepsia* is a vague intolerance to a heavy meal, fatty or fried foods, and to bean and cabbage families, with anorexia, epigastric fulness and discomfort, eructation, flatulence, nausea and perhaps vomiting and reflex esophagospasm. It is as difficult to relate these to absence of the gallbladder as it was unwarranted to use them to justify cholecystectomy. These functional digestive complaints may arise from biliary dysfunction or reflexly from organic derangement of any segment of the digestive tract or cardiovascular system, or they may be purely an emotional response.

2. *Pain* may be of several varieties. True colic of a dyskinetic variety occurs in paroxysms, is well localized in the right epigastrium, penetrates posteriorly, extends to the interscapular area and is relieved by taking nitroglycerin. Deep, boring, constant pain in the midepigastrium penetrates posteriorly and is at times relieved by lying on the abdomen or flexing the spine, suggestive of terminal choledochal obstruction or pancreatic involvement. Severe pain in the right epigastrium is accompanied by fever, nausea, vomiting and localized tenderness, more suggestive of cystic duct remnant or reformed gallbladder with disease or calculi.

3. *Jaundice* caused by neoplasm, calculus or pancreatitis is persistent and increasing in intensity. Intermittent or relatively nonprogressive jaundice may accompany cholangitis, ball-valve stones, stenosis, inflammatory states, associated hepatic disease, an ampullary polypoid lesion and, more rarely, duodenal disease (i.e., duodenitis or duodenal ulcer). The differentiation of extrahepatic from intrahepatic obstruction is imperative.

4. *Nausea and vomiting* may be a part of any type of postcholecystectomy disturbance, but it may be more specific in some instances to indicate obstructive gastric or duodenal involvement. Hematemesis may suggest concomitant esophageal varices, erosive esophageal or gastric involvement or such bleeding sites as an ulcer or ulcerated neoplasm of the stomach, duodenum, ampulla or ductal structure.

5. *Fever*, especially accompanied by chills, most often heralds ascending cholangitis and is most frequent with obstructive phenomena, whether calculus or neoplastic. Hepatitis, pancreatitis and abscess may explain pyrexic episodes.

6. *Postoperative biliary fistula* may indicate predisposition to pericholedochal reaction as a part of the healing process and suggests ductal injury or obstruction.

7. *Loss of weight* after cholecystectomy may suggest a neoplastic process or malabsorption, or it may result from anorexia associated with jaundice, pain or general disability.

8. *Abnormal stools* may reflect deficiency of bile pigment or faulty fat digestion, to suggest defective bile production or flow or pancreatic deficiency with characteristics of steatorrhea.

9. *Bleeding tendency* as a manifestation of hypoprothrombinemia may indicate hepatic failure or defective absorption from lack of bile salts in the intestines.

10. *Diabetes mellitus* will strongly suggest associated chronic pancreatitis or pancreatic neoplasm.

11. *The edema of hypoproteinemia* may accompany severe debilitating postoperative states with prolonged oral protein deprivation or may indicate the degree of causal or associated hepatic failure.

12. *Melena* suggests a high bleeding site: varices, erosions, ulcer, neoplasm or hemorrhagic tendency.

Evaluation of the symptoms alone may provide a definitive diagnosis without further investigation. If not, further collaborative diagnostic measures are necessary.

Physical Examination

On physical examination the manifestations of fever, jaundice, weight loss, evidence of hypoproteinemia and bleeding tendency will be obvious. In addition, a mass, evidence of inflammatory or neoplastic involvement, hepatic enlargement or tenderness and stigmata of cirrhosis may be noted.

Laboratory Examination

The laboratory survey should include such routine examinations as urinalysis with evaluation for bile and urobilin. The hematologic study should include determination of prothrombin time and evidence of hemolysis. The liver profile used to evaluate the type of jaundice should include determination of serum bilirubin, cephalin flocculation, alkaline phosphatase, thymol turbidity, serum proteins and, in selected instances, bromsulfalein excretion and enzymatic tests. Demonstration of blood in gastric contents or stools signifies a bleeding lesion. Duodenal drainage is a definite adjunct in many cases; the presence or absence of bile, and its type and crystalline constituents, give an evaluation of the common duct patency and content. Secretin and pancreozymin stimulation of pancreatic function with evaluation of enzymatic response supplements glucose and starch tolerance tests. Cytology may occasionally reveal neoplastic cells, indicating the diagnosis.

Hepatic needle biopsy should be considered in all questionable cases, to evaluate hepatic changes compatible with Dubin-Johnson disease, cholestatic jaundice, homologous serum jaundice and the early changes of biliary cirrhosis.

Radiologic Examination

Review of the precholecystectomy roentgenograms of the biliary tract, if available, may be rewarding. However, as Kirklin (20) wrote,

> Like all laboratory tests, especially those applied to the x-ray, the greatest misfortune to cholecystography has been, not the scant criticism it has received, but the tendency to credit it with infallibility and to depend supinely on its verdicts.
>
> In spite of the general efficiency of cholecystography, it has its limitations and is subject to errors of interpretation many of which will probably continue to be inevitable. . . .
>
> A keener realization that the diagnosis of cholecystic disease is ultimately the function of the clinician and not of cholecystography or any other laboratory test is urgently to be desired. . . .

Cholecystography, a measurement of functional integrity of the biliary system, demands five physiologic mechanisms for successful opacification to demonstrate function and visualization (14): (1) adequate ingested dye must be absorbed into the circulation (this requisite is not applicable to intravenous cholecystography); (2) the dye must be excreted in sufficient quantity by the liver; (3) the ductal system must be patent; (4) terminal choledochal sphincteric resistance must exist; and (5) the gallbladder must be capable of dye concentration.

Therefore, in evaluation we should know:

1. Was an adequate quantity of dye ingested after a fat-free meal?
   a) Did the patient retain the dye; i.e., was there vomiting, diarrhea or both?
   b) Was there esophageal or pyloroduodenal obstruction?
2. Was hepatic excretory function adequate?
3. Was there jaundice or ductal obstruction?
4. Had any medication induced relaxation of the sphincter of Oddi?
5. Did acute inflammatory disease or edema impair concentration?

On the basis of such re-evaluation, one may be able to determine if the gallbladder had been cholecystographically proved responsible for the precholecystectomy complaints.

The four methods of radiologic visualization of the biliary tract, in the order of frequency of usage, are: (1) oral cholecystography and cholangiography; (2) intravenous cholecystography and cholangiography; (3) operative and postoperative cholecystography and cholangiography; and (4) transcutaneous hepatic cholangiography.

Oral cholecystography may be performed with any one of several media but with the realization that each varies in its mode of action

to some degree. Priodax® opacifies the gallbladder primarily by concentration, and therefore mucosal withdrawal of water is imperative, whereas Telepaque® and Tridax require only minimal concentration. Orabilex®, rapidly absorbed and renally excreted, gives more frequent ductal visualization (40). Regardless of care and technic, oral cholecystography is not routinely accompanied by cholangiography adequate for concomitant common duct evaluation, despite the enthusiastic claim of Twiss (41) for satisfactory postcholecystectomy cholangiographic visualization with administration of oral Telepaque®.

Intravenous cholangiographic evaluation before cholecystectomy may supplement oral cholecystography to establish the status of the excretory ductal system, permit more accurate preoperative evaluation and lead to more exact and definitive ductal surgical treatment when indicated. It is essential to accurate diagnosis in the symptomatic postcholecystectomy patient and may indicate: (1) the surgical procedure was incomplete and should have included more than simple removal of the gallbladder, and, at times, removal of common duct calculi; or (2) mechanical or inflammatory ductal injury occurred during or after operation.

The two media in common usage are Cholografin® and Duografin®. The latter also permits concomitant pyelography for the differential diagnosis of biliary and renal disease.

The value of the procedure has been stressed by Buxton and Burk (4), who reported retained common duct stones in 3.6% of 249 patients on whom surgical exploration of the common duct had been unrewarding.

Operative cholangiography is an integral part of adequate exploration of the common duct. Definite technical difficulties exist; but in indicated instances the procedure may prevent the occurrence of postcholecystectomy difficulty, and in postcholecystectomy patients may reveal the answer when manual exploration of the ductal systems has been unrewarding. Since its introduction in 1932 (29), technical improvement has been progressive, and recently more satisfactory opaque media have become available (37).

Operative cholangiography may be performed with Hypaque®, Diodrast® or Urokon®. Careful elimination of air to prevent the occurrence of a deceptive artefact (gravity filling), use of a polyethylene catheter or direct needle insertion into the common duct, irrigation and reinjection are requisites to the study.

Knowledge of the size of the common duct at the time of operation is a guide to future intravenous cholangiographic evaluation. If

the duct was smaller at the time of operation, demonstrable enlargement later is probably due to ductal obstruction, for comparative studies show that the common duct does not normally increase in diameter after cholecystectomy (22).

Completion cholangiogram through the T tube is a further adjunct often advisable when a difficult choledochus exploration with removal of many calculi has been performed. It may indicate residual calculi or a previously undisclosed terminal choledochus obstruction.

Postoperative cholangiography through the T tube should be routine before elective removal of a T tube giving final operative assisted visualization of the ductal system (30).

Transcutaneous hepatic cholangiographic visualization with Diodrast® has been endorsed as a method of study of the biliary tract in the jaundiced patient (16). Biliary peritonitis, a potential complication, may call for reservation in general adoption of this procedure.

The preoperative serial cholecystographic studies with volume and angle of erection computation advocated by Rose (33) to determine hypokinesia or hyperkinesia, and thereby to predict the need for right splanchnicectomy for hypotonia or for "low vagotomy" for hypertonia, awaits more adequate evaluation. The interest in such studies, followed by pressure studies at operation in South America, France (26, 5) and England (32), indicates the possible development of facts that may modify our concepts in the future.

In addition to roentgenography of the biliary tract, completeness of study may often require elimination of other concomitant or causal diseases. The routine roentgenogram of the chest aids in eliminating the diagnoses of cardiovascular and obvious metastatic disease. In patients with questionable segmental nerve pain, the lower dorsal spine should be studied. The gastrointestinal series complemented by barium enema is essential to proper investigation of complicated biliary disturbances. Saint's triad, hiatal hernia, biliary disease and diverticulosis comprise the concomitants. Any esophageal, gastric, duodenal or pancreatic contribution to the clinical picture can be deduced from results of a careful gastrointestinal series.

DIFFERENTIAL DIAGNOSIS

The diagnostic measures previously discussed should establish the factor or factors responsible for the postoperative difficulty. If the indication for surgical intervention has been correct, there is still

the possibility that associated nonbiliary disease unrelated to the operation may have been rendered symptomatic by operative or postoperative difficulties. Previously asymptomatic coronary heart disease may, by the anesthetic and surgical stress, become coronary insufficiency. Osteoarthritis may, by postural trauma, excite seg-

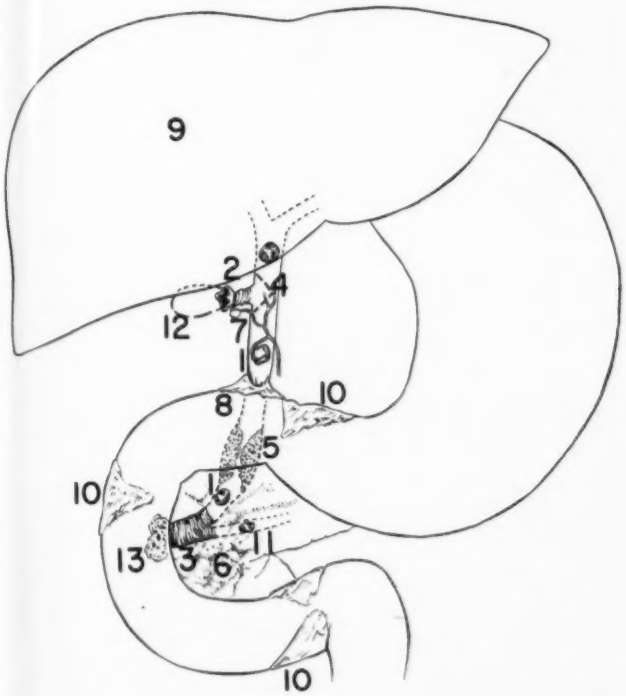

FIG. 1.—Some causes of postcholecystectomy difficulty: *1*, common duct stones; *2*, excessive cystic duct stump; *3*, sphincter of Oddi spasm (hypertrophy, stenosis, dyskinesia); *4*, strictures of common bile duct; *5*, cancer of biliary tract; *6*, pancreatitis; *7*, amputation neuroma; *8*, adhesions constricting common bile duct; *9*, hepatic complications; *10*, periantroduodenal adhesions; *11*, pancreatic lithiasis; *12*, re-formed gallbladder; *13*, cancer of ampulla of Vater.

mental pain. Esophageal intubation, anesthesia or vomiting may create esophagitis in a silent hiatal hernia. An ulcer may be activated by operative stress. The postoperative use of antibiotics may excite inflammatory changes in quiescent diverticulosis.

If these possibilities are not responsible for the postoperative dilemma, the most likely causes are surgical failure, an associated biliary disease or the residuals of obstructive or inflammatory ductal disease. In our estimate of the order of frequency, the most likely possibilities are as listed below; but it must be realized that one must consider additionally all sources of skeletal, intraperitoneal and retroperitoneal disease whose symptoms might be referred to the biliary area or which might excite functional responses in the upper digestive tract.

1. Common duct obstruction
   - *a*) Calculus
   - *b*) Stricture
   - *c*) Pericholedochal adhesions
   - *d*) Neoplasm
   - *e*) Cholangitis: Suppurative, Nonsuppurative
2. Cystic duct remnant
3. Gallbladder remnant
   Re-formed gallbladder
4. Sphincter of Oddi obstruction
   - *a*) Dyskinesia
   - *b*) Stricture
   - *c*) Hypertrophy
5. Pancreatic disease
   - *a*) Pancreatitis, acute—chronic
   - *b*) Lithiasis
   - *c*) Neoplasm
6. Ampullary tumors
   - *a*) Benign papilloma
   - *b*) Carcinoma
7. Hepatic disease
   - *a*) Hydrohepatosis
   - *b*) Hepatic lithiasis
   - *c*) Biliary cirrhosis
   - *d*) Fatty degeneration
   - *e*) Chronic idiopathic jaundice
   - *f*) Gilbert's disease
   - *g*) Serum hepatitis
8. Amputation neuroma
9. Periantroduodenal adhesions
10. Cholangiolitis
11. Fistula

One must never be guilty of overlooking *serum hepatitis*, resulting from transfusions during or after operation, as a relatively unrelated accident which may suggest a recurrent difficulty rather than a new entity. Such rarities as *choledochal* or *hepatic cysts* may also be overlooked. The most frequent cause of recurrent symptoms is *retained common duct stones*. These may be *residual, overlooked* or

re-formed calculi from failure to open the common duct, or all the calculi may not have been removed when the duct was explored. We may be inclined to discard the older reports of 15–25% residual calculi after choledochotomy in the era of the development of cholangiography (31) and the enthusiasm for dissolving residual stones, but we cannot disregard reports of a 10% occurrence after

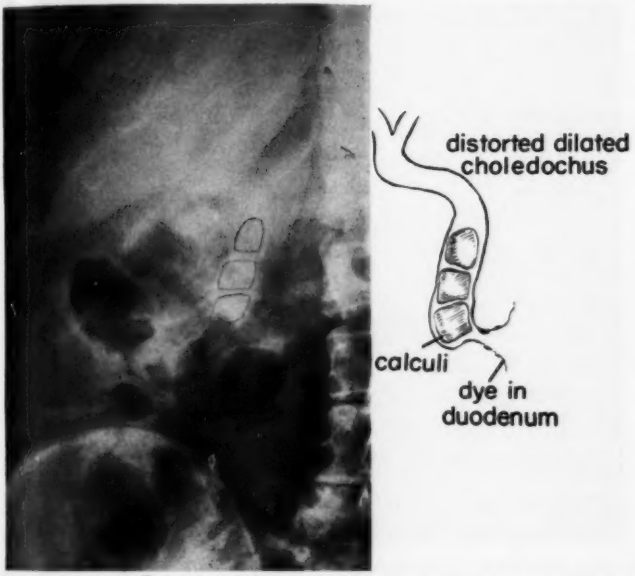

FIG. 2.—White woman, 72, cholecystectomy for acute cholecystitis (no operative cholangiogram); 1 year later cholangitis with obstructive jaundice. Intravenous cholangiogram (above) showed retained common duct stones with incomplete obstruction permitting flow of Cholografin® beyond calculi into duodenum.

choledochotomies when intravenous cholangiography has supplemented improved operative cholangiography (39).

Certain conditions may prevent removal of all calculi: (1) Intrahepatic calculi may defy all efforts at removal, in that they may be beyond reasonable surgical localization or removal but may migrate into the common duct after surgical exploration. (2) Biliary "sand"

may represent stones which are too small to palpate or which elude the scoop. (3) Encysted calculi loculated in diverticular sacs, crypts or ulcerations close to the ampulla of Vater and in the hepatic ducts, which are not truly intraluminary and do not obstruct passage of sounds and scoop, may not be detected on duct opacifications because the dye may not enter the sac. (4) Impacted stones in the

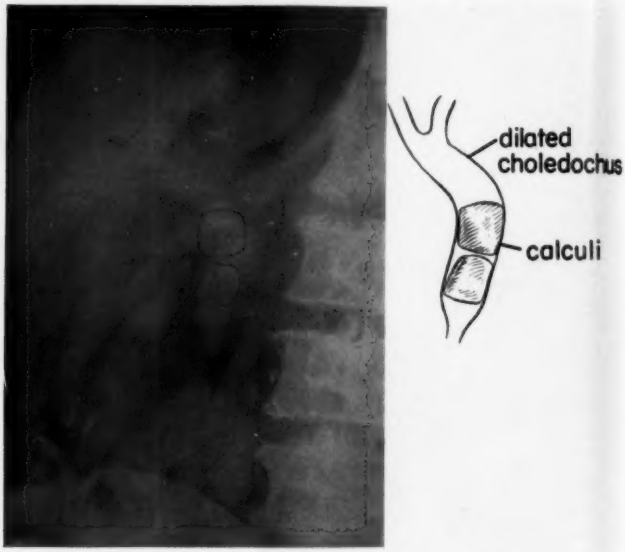

FIG. 3.—White man, 54, cholecystectomy with choledochostomy; 4 years later biliary colic. Roentgenogram indicated that calculi, too large to have been overlooked at first surgery, may have formed in common duct from nidus left when stones were removed.

terminal choledochus around which sound or scoop may be passed into the ampulla or which, if found, may be forceps-crushed in forceful removal, may leave residual fragments which form a nidus for new stone formation.

Re-formed calculi in the common duct, an occurrence looked on with considerable skepticism by some, is supported by more recent experimental observations of common duct obstruction predisposing to calculi formation, rather than the opposite relationship (19).

Common duct calculi are usually manifested by recurrent attacks of pain accompanied by jaundice and often by the typical febrile manifestations of cholangitis. Intermittency of attacks is common. Clinical correlations along with an elevated alkaline phosphatase

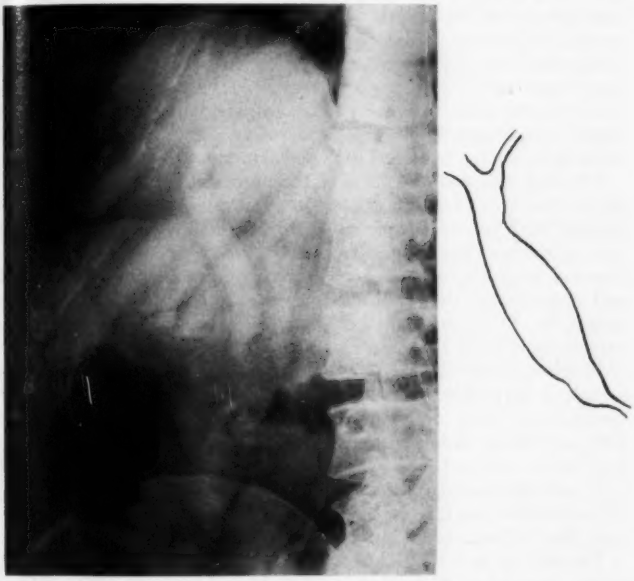

Fig. 4.—White woman, 56, cholecystectomy; 15 years later pain and weight loss but no jaundice. X-ray showed abnormally dilated choledochus. On exploration and at postmortem the choledochus was found to be enlarged but normal. Final diagnosis was cecal carcinoma.

level and direct-acting bilirubin with confirmatory intravenous cholangiographic observations usually determine the diagnosis.

Charcot type recurrent fever without pain in 20% and without jaundice in 25% has been described. Such instances should be suspected when unexplained fever occurs in the cholecystectomized patient (18).

Although increase in diameter of the choledochus is usually considered indicative of a common duct calculus, this is not too reliable

a sign, since caliper measurement shows enlargement of the ductal diameter to be too insignificant for such a conclusion (9).

Strictures of the common duct and adhesions usually become manifest by gradually developing, often painless, progressive jaundice some months after operation (3, 7). Pain, fever and chills indicate associated cholangitis. Cholangitis should be more often expected if dissection of the cystic duct has been complicated, primary closure has been performed after choledochotomy, dilators or scoops have been extensively employed to dislodge a calculus, a febrile postoperative course suggests localized peritonitis, a temporary bile fistula complicates the postoperative course, or anomalies, obesity or other factors have rendered the operation more difficult.

Cholangiographic depiction of the narrowing or angulation, usually in the area of cystic duct injunction or in the terminal choledochus, with or without elevation of the alkaline phosphatase level may accompany the suggestive history. When, however, obstructive jaundice is severe, intravenous cholangiography may be unsuccessful and indicate the desirability of percutaneous transhepatic cholangiography. Distinguishing this entity from adhesions or neoplastic narrowing is rarely conclusive.

Periductal adhesions may cause ductal narrowing by angulation or actual encroachment and become manifest some months after operation in deep, dull painful intermittent or constant symptoms with or without elevation in serum bilirubin and alkaline phosphatase levels. Patients with extensive adhesions may have associated pain and dyspepsia suggestive of peptic ulcer with pyloroduodenal partial obstruction manifested by nausea and vomiting, often occurring after a large meal but typically relieved by postural change.

The history, likened to that of a stricture, usually suggests surgical injury or accident and often is related to T-tube or drainage-tube complication.

The cholangiograms may depict significant angulation in some cases, but significant narrowing is difficult to demonstrate. Barium studies of the pyloroduodenal area may reveal distortion and displacement of this segment with varying degrees of gastric retention.

Neoplasms of the common duct occur with sufficient frequency to be considered in the differential diagnosis of postcholecystectomy syndrome. They sometimes are associated with calculi, and are small, perhaps located high (hepatic duct) and therefore easily overlooked. If progressive, relatively painless, obstructive jaundice occurs immediately after operation or if choledochal drainage, T-tube or fistulous drainage persists for an unduly long time, neoplasm is a

more likely diagnosis than stricture or calculus. If cholangiography reveals a constricting lesion, it is usually at a site atypical for a benign stricture. Duodenal cytology may provide helpful information in making the diagnosis.

Cholangitis (choledochitis) is generally defined as an inflammatory involvement of the extrahepatic ductal system. It may be suppura-

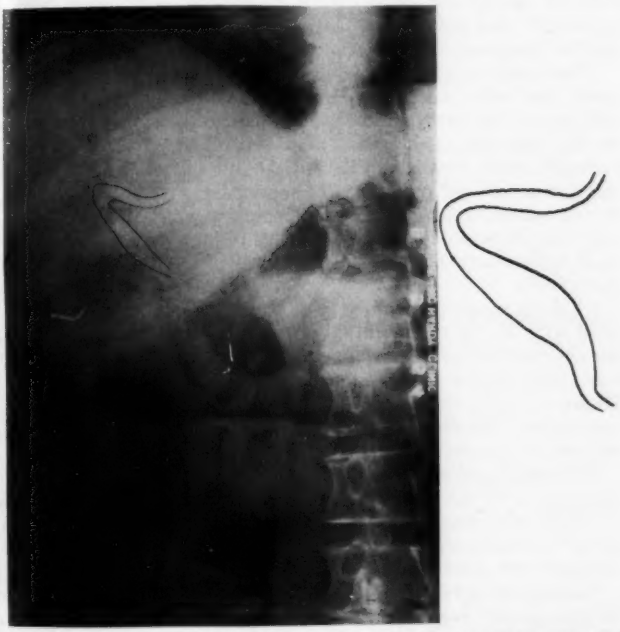

FIG. 5.—White man, 47, cholecystectomy with choledochostomy, had pain and intermittent jaundice 1 year later. Stasis related to angulation (shown in above x-ray) may have contributed to the sludge accumulation found at surgery. Adhesions were released; T-tube drainage. No symptoms after surgery.

tive but is more frequently nonsuppurative. Ductal stasis due to obstruction predisposes to the occurrence with its suppurative status implying a superimposed pyogenic infection usually with ascension to potentiate hepatic abscess. Chills, intermittent fever and localiza-

tion, of abrupt onset and followed by low-grade jaundice and mental confusion, characterize the illness. It occurs more frequently after operation done in the presence of acute cholecystitis or other adjacent inflammatory reaction when the common duct is explored.

The suspicion may be confirmed by demonstration of inflammatory elements in the bile obtained by biliary drainage. In the suppurative variety the development of obvious progressive hepatic tenderness and enlargement favors the diagnosis of complicating hepatic abscesses.

There may be a *cystic duct remnant*. Surgical dissection of the cystic duct when anomalies exist may, in the face of acute cholecystitis or when recurrent disease has masked strictures in adhesions, tax the ingenuity of the most competent biliary surgeon. When an excessive cystic duct stump is inadvertently left, it is usually a diseased structure and prone to continue inflammatory activity, formation of calculi and physiologic derangement with biliary colic and other dyspeptic complaints. The difficulty may persist immediately after operation or may recur at intervals of months to years postoperatively.

Cholangiographic depiction of a remnant must be closely correlated with the clinical picture, lest one repeat a misdiagnosis, since asymptomatic remnants are common (23). A greatly elongated remnant demonstrable radiologically is more diagnostically convincing. Biliary drainage, demonstration of cholesterol crystals with or without calcium bilirubinate pigment, or radiologic demonstration of a calculus is strongly confirmatory.

Re-formed gallbladder may in many instances represent surgical amputation of the gallbladder rather than cholecystectomy. This condition, therefore, should produce manifestations identical with those for which operation was performed or may be modified to compare with a residual stump.

Cholecystographically, the gallbladder is demonstrated as a deformed, poorly functioning organ with or without demonstrable calculi.

An *obstruction of the sphincter of Oddi*, owing to spasm, stricture or hypertrophy, may influence the function of this structure and become manifest in painful episodes of dyspepsia, usually with nausea and vomiting, with or without jaundice. Such manifestations may occur any time after cholecystectomy but usually develop early.

Spasm may represent that physiologic neuromuscular derangement titled "biliary dyskinesia"—i.e., a transient, recurrent, colic-like pain in the deep midepigastrium relieved by nitroglycerin, and may not be accompanied by jaundice or acute inflammatory reaction. I

believe this entity is frequent when a functioning gallbladder has been removed and is rare when the tract has been conditioned by a nonfunctioning organ.

Stricture or fibrosis causes true stenosis and usually results from the inflammation or trauma related to cholangitis, calculi, passage of probe, dilator or scoop, from sphincterotomy itself or from a long-

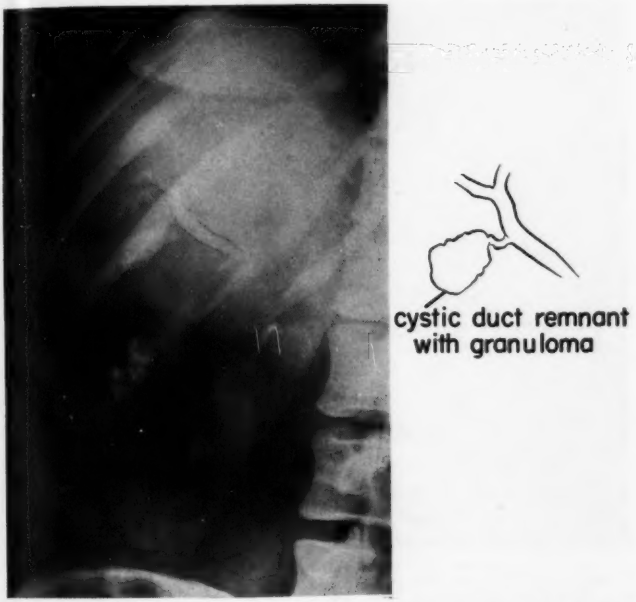

FIG. 6.—White woman, 43, noncalculous gallbladder removed, had recurrent cholangitis and pancreatitis. Roentgenogram showed cystic duct remnant with granuloma; reoperation, 9 years after surgery. The granuloma, a foreign-body reaction due to suture, contributed to the recurring symptoms.

limbed distal T tube when removal is followed by contraction. The pain has more depth, usually with posterior extension, is more constant and more frequently accompanied by jaundice.

I am not convinced that a specific pattern of biliary drainage is demonstrable, as suggested by some (10, 21).

The diagnosis of dyskinesia may be assumed when cholangiography reveals narrowing induced, with pain, by administration of morphine and relaxed and relieved by nitroglycerin. The stricture, fibrosis and hypertrophy may be suspected when narrowing of the terminal choledochus can be seen on cholangiography (42) and the common duct remains demonstrable beyond an hour. Surgical ex-

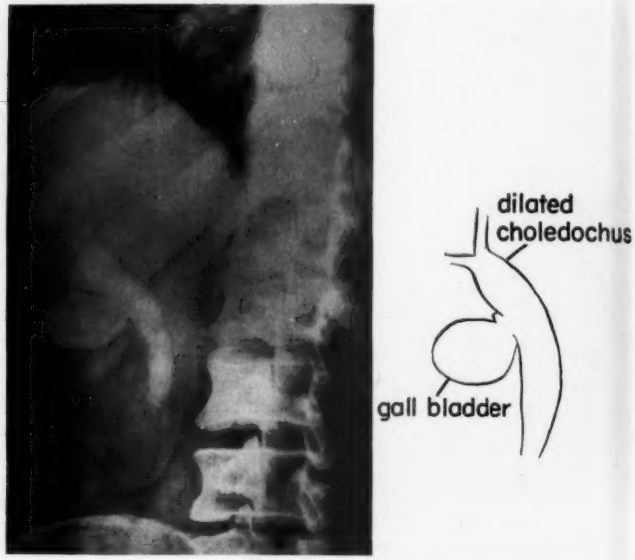

FIG. 7.—White woman, 60, cholecystectomy; biliary pain 9 years later. A gallbladder remnant and choledochal dilatation were found by x-ray; there was inflammation but no obstruction to the common duct.

ploration with cholangiography, manometric studies (38) and demonstration of the terminal choledochal status by biopsy may be necessary to establish the diagnosis and justify sphincterotomy.

Pancreatic disease is frequently associated with disorders of the biliary tract. Pancreatitis and pancreatic neoplasm in various phases may encroach on the terminal choledochus to share in varying degrees of intermittent and persistent jaundice with or without pain. The distribution of pain usually changes to predominantly left upper

abdominal and dorsal. Surgical trauma or surgical failure to relieve obstruction may be directly related to the occurrence of immediate postoperative difficulty or to delayed obstructive phenomena. An overlooked pancreatic neoplasm or pancreatic ductal calculus will

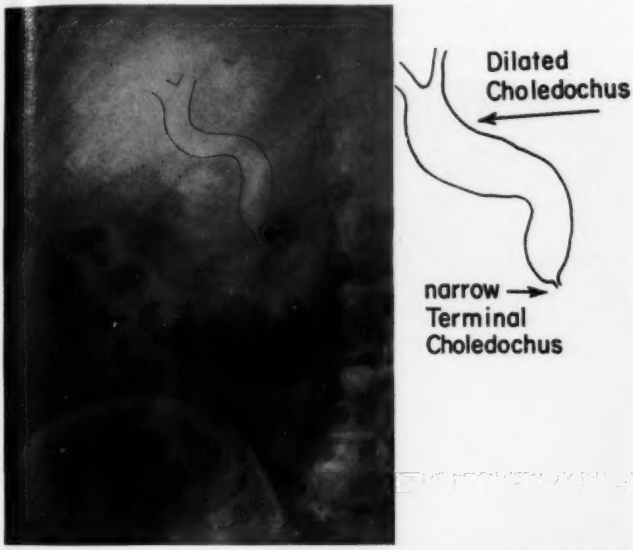

FIG. 8.—White woman, 60, who had had cholecystectomy, had dyskinesia and intermittent jaundice during the following 5 years. X-ray (*see above*) showed a typical and conclusive example of biliary dyskinesia; the common duct was demonstrable 80 minutes after intravenous injection of Cholografin®. Reoperation, 5 years after first surgery, revealed hypertrophy of the sphincter of Oddi, and sphincterotomy was done. No symptoms 4 years later.

result in persistence of difficulty when a calculous but normal gallbladder has been removed.

Those tests indicative of pancreatic involvement may be concomitants of ductal obstruction due to other causes. The alkaline phosphatase elevation is not specific. Elevated amylase or lipase, however, is more specific in acute, smoldering or recurrent pancreatitis. Abnormal glucose or starch tolerance, or both, is indicative of chronic pancreatic disease or neoplasm.

Disturbance in the duodenal contour, displacement, loop widening or displacement of the duodenojejunal angle may be found. Oblique films of the pancreatic area will reveal the always opaque calculi.

Pancreatic steatorrhea and abnormal absorption of I^{131}-labeled triolein with normal oleic acid absorption is compatible with a diagnosis of chronic pancreatitis or pancreatic carcinoma (34).

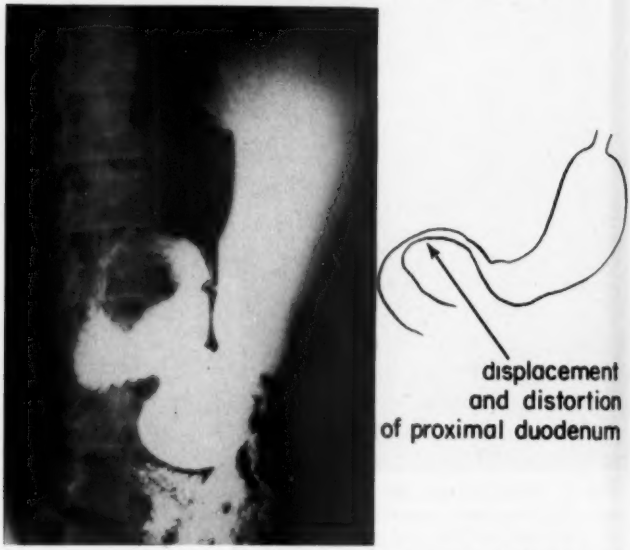

FIG. 9.—White man, 32, who had had calculous gallbladder removed, had extrahepatic obstructive jaundice 1 year later. Roentgenogram revealed minimal duodenal deformity due to carcinoma of the head of the pancreas not revealed at earlier surgery.

Careful clinical analysis of all factors will usually permit an accurate diagnosis, although some instances of mild chronic pancreatitis or slowly growing pancreatic neoplasm of the body or tail may defy diagnostic effort. Duodenal intubation, secretin pancreozymin study and cytology are diagnostic adjuncts of distinct value.

Ampullary tumors (neoplasms at the papilla of Vater) are easily overlooked; they usually occlude the common duct intermittently

before completely obstructing the lumen. Benign papilloma, carcinoma of the ampulla of Vater or carcinoma of the adjacent common duct, pancreatic duct, pancreas or duodenum may be included under this category; their location is most important because of encroachment on the papilla. These lesions most frequently result in dual obstruction—i.e., of the pancreas as well as the common duct.

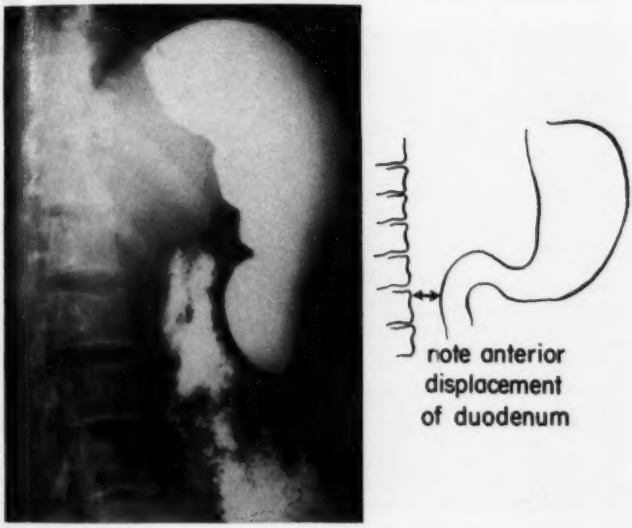

FIG. 10.—White woman, 72, calculous gallbladder removed; obstructive jaundice 16 years later. Anterior displacement of the duodenum was the diagnostic clue. Carcinoma of the head of the pancreas was found at surgery.

Manifestations may include, in addition to the usual obstructive phenomenon, intermittent and then progressive jaundice, guaiac-positive and pancreatic-deficient stools.

If the clinical picture suggests extrahepatic obstructive jaundice as a part of continued symptoms after cholecystectomy, a careful radiologic evaluation of the duodenum should be made. Drainage with guaiac-positive, pancreatic and bile-deficient secretion may be cytologically positive.

Hepatic diseases may result from prolonged, intermittent or persistent extrahepatic obstruction. They vary with the duration, completeness of obstruction and association of infection.

a) *Hydrohepatosis* is considered the end result of complete, prolonged, extrahepatic obstruction with accumulation of bile pigment in the hepatic substance and progresses through a series of deterioration alterations without bacterial infection: (1) The bile capillaries

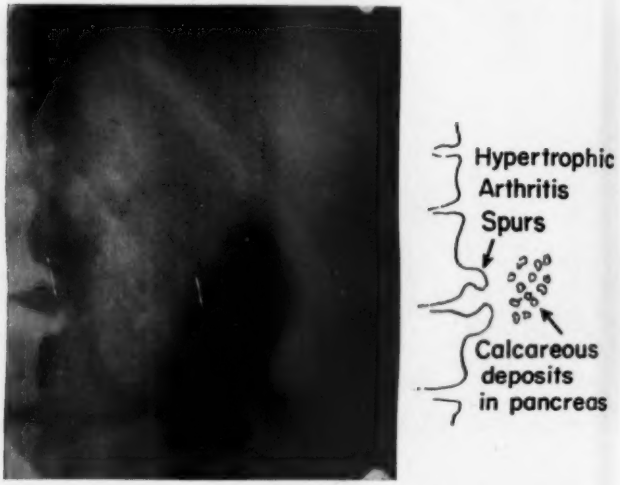

FIG. 11.—White man, 52, cholecystectomy followed by painful recurrent jaundice. Cholangiograms were normal, but x-ray showed hypertrophic arthritis spurs and calcareous deposits in pancreas. Diagnosis: chronic relapsing pancreatitis.

dilate, and there are centrilobular bile casts with adjacent hepatic cell degeneration. Although the serum bilirubin and alkaline phosphatase levels are elevated and there is bilirubinuria, the urinary urobilinogen is reduced and the result of the flocculation tests remain normal. (2) An inflammatory reaction to bile stasis develop with portal fibrosis. Greatly elevated alkaline phosphatase levels may be encountered with elevation in the total serum cholesterol value. (3) Cholangiolar dilatation and inspissations with bile result in progressive deterioration evidenced by extravasation of bile into the

parenchyma, bile infarcts and eventual severe dilatation of the intrahepatic bile ducts with secondary vascular and compression changes creating cellular damage. The flocculation tests show positive results, and serum protein levels drop.

b) ***Biliary cirrhosis*** may result. Prolonged, incomplete or intermittent obstruction with infection is considered causal. Infection and not jaundice predominates. Hepatic enlargement and tenderness

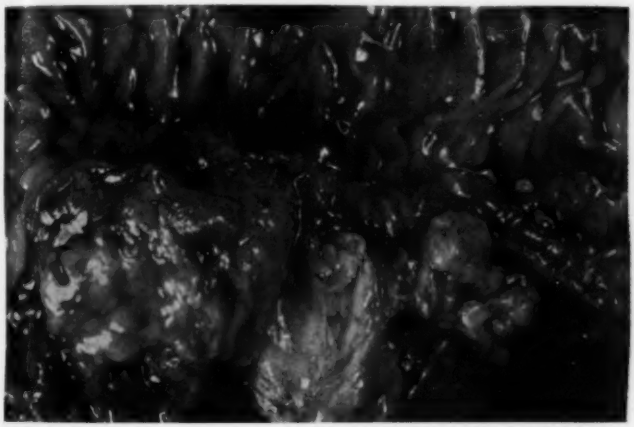

FIG. 12.—White man, 55, cholecystectomy and choledochostomy because of calculous gallbladder with jaundice; postoperative cholangiograms were normal. There was intermittent obstructive jaundice and melena for 18 months. Diagnosis and treatment were delayed on the assumption of a postcholecystectomy component illness (extrahepatic obstruction). Reoperation (modified Whipple resection) revealed a papillary carcinoma of the ampulla of Vater.

are accompanied by a Charcot type of fever. The results of the flocculation tests are positive, and there is gamma globulin elevation. Portal hypertension, splenomegaly and hepatic abscesses complicate the terminal picture. Liver biopsy is rarely risked, and the diagnosis is made from the listed data.

c) ***Fatty liver*** may be an end result. Imbalanced nutrition, general undernutrition or lack of one specific dietary component, most frequently a component of alcoholism, may often be associated with biliary disease and be the cause of persistent postoperative debility

when unrecognized or when complicated by some degree of hepatic failure or cirrhosis. Usually the laboratory findings of bromsulfalein retention and elevation of alkaline phosphatase will be accompanied by a specific biopsy to confirm the diagnosis.

d) Chronic idiopathic jaundice (Dubin-Johnson syndrome, macrohepatic icterus) should be considered in the differential evaluation, since in a recent survey of this entity 31 of 50 patients had had

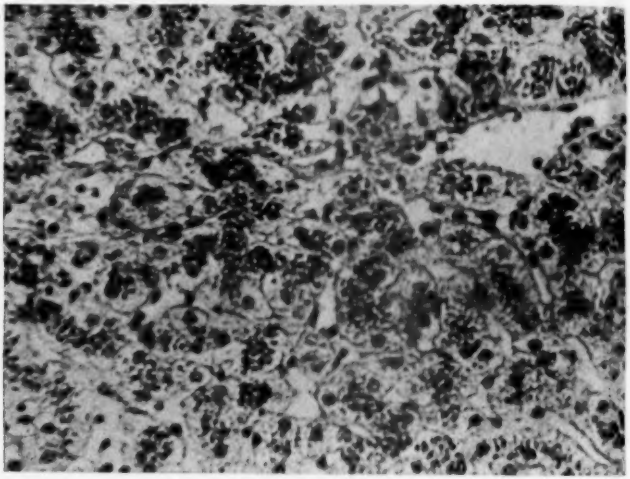

FIG. 13.—Coarse granular brown pigment in parenchymal cells in Dubin-Johnson syndrome.

exploration for biliary disease (8). Obviously, cholecystectomy (some had calculous gallbladders) did not improve the liver's ability to excrete direct bilirubin into the bile. The prolonged intermittent history of jaundice in a relatively well, young, white man with a nonfunctioning gallbladder determined by cholecystography, dark urine and bilirubinemia, direct-acting serum bilirubin in the neighborhood of 60% and impaired bromsulfalein excretion requires histologic evidence of pigmentation with minimal histologic change to establish the diagnosis.

e) Constitutional hepatic dysfunction (Gilbert's disease, familial nonhemolytic jaundice) also causes chronic intermittent jaundice;

but in this condition, a functioning gallbladder is demonstrated cholecystographically, bromsulfalein excretion is normal, there is no direct, but instead indirect, bilirubin, and the urine is clear. Hepatic biopsy reveals normal histology (35).

f) Serum hepatitis should be considered. The insidious development of jaundice 30 days or longer after a blood transfusion given during a biliary operation may mislead the clinician to think in terms

FIG. 14.—White woman, 56, cholecystectomy for acute cholecystitis. One year later, duodenojejunostomy because of duodenal obstruction. Localized peritonitis at the first operation contributed to the obstructive phenomenon similating duodenal ileus.

of recurrent disease or surgical failure when a new entity has developed. The laboratory manifestations suggesting intrahepatic jaundice should be confirmed by the specific findings on hepatic biopsy. The possibility of an inoculation infectious hepatitis from a preicteric hepatitis donor is also a possibility.

Periantroduodenal adhesions from surgical trauma or bile peritonitis may result in fixation and distortion of this segment, creating obstructive symptoms, megaduodenum and postprandial distress relieved by certain postural changes. The radiologist may suspect the

occurrence, suggest an undisclosed postbulbar ulcer, antral gastritis or neoplastic infiltration. The clinician must weigh the situation in detail. If preoperative films are available for comparison, the diagnosis will be more obvious; if not, the clinician may expend con-

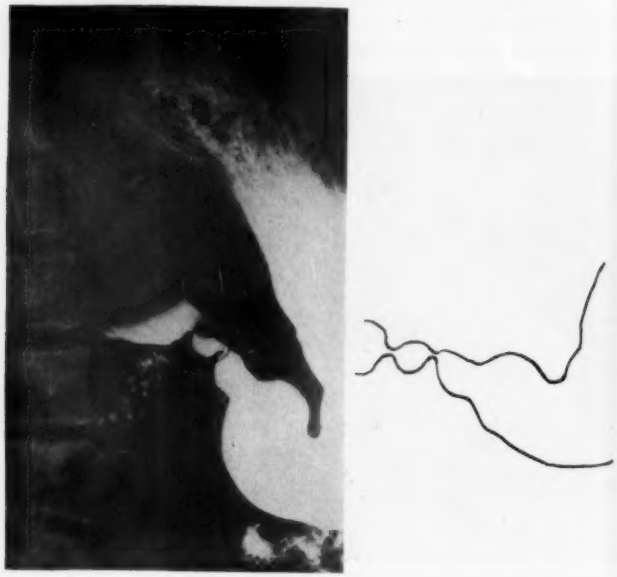

FIG. 15.—White woman, 48, cholecystectomy for acute cholecystitis. Partial pyloric obstruction 9 years later suggested malignancy. X-ray indicated adhesions creating an antral deformity and fixation antral neoplasm was suspected. At reoperation, periantroduodenal adhesions were freed and an antral resection done. No symptoms 8 years later.

siderable diagnostic effort in cytology and gastroscopy before concluding the need for mechanical relief.

Cholangiolitis may result. Cholestasis without hepatic parenchymal damage and without extrahepatic obstruction may occur, resulting in a bizarre picture for which a cholecystectomy may have been erroneously performed. Such occurrences, in relation to recovery from viral hepatitis or drug administration, may give the picture of

obstructive jaundice by negative response to flocculation tests and elevation of alkaline phosphatase and total serum cholesterol. Only suspicion and biopsy will permit the diagnosis and clarify the picture of persistent jaundice.

Fistula formation may occur. An external fistula is a not uncommon complication to cholecystectomy where there is distal obstruc-

FIG. 16.—White woman, 54, cholecystectomy and choledochostomy because of calculous cholecystitis and choledocholithiasis. One year later, painful febrile jaundice diagnosed as extrahepatic obstruction jaundice. Hepatic biopsy revealed choleostatic jaundice. History of chlorpromazine therapy was revealed. Cholestatic jaundice should be suspected in all cases of extrahepatic obstructive jaundice.

tion. The diagnosis in such cases is usually obvious from the cutaneous flow of bile. Careful delineation of the fistula with opaque media depicts the site of obstruction. An internal fistula is often overlooked. It may result spontaneously when pressure ulceration causes perforation of the choledochus into approximating stomach or duodenum; more rarely from gastric or duodenal ulcer perforation into the choledochus; and occasionally may be the result of trauma in subtotal gastric resections carried into this critical area of the duodenum for ulcer resection.

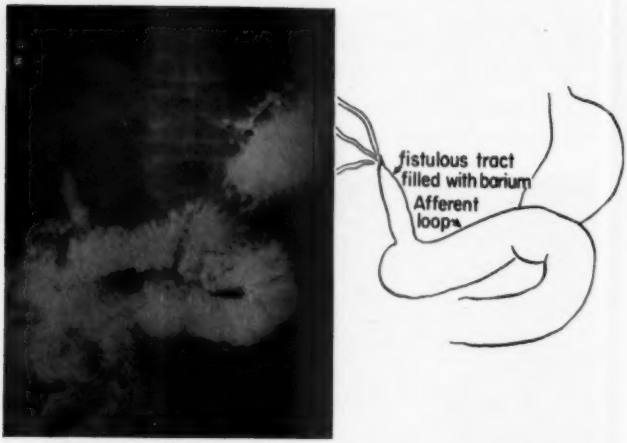

FIG. 17.—White man, 49, gastric resection for perforated duodenal ulcer; recurrent jaundice during the following year. Cholangiograms were normal. Gastrointestinal series revealed an afferent loop duodeno-choledochal fistula.

TREATMENT

Management of the postcholecystectomy syndrome demands individualization of cause and tailoring of therapy accordingly. Obviously, mechanical factors (biliary or extrabiliary) that are amenable to operative treatment should be corrected surgically after careful co-operative diagnostic judgment and preparation. In most cases, this is required by recurrent biliary colic with or without jaundice. In many instances the patient is a poor operative risk and his physical status declines further with undue procrastination. However, every care should be taken to prevent further recurrence, which unfortunately is common. In addition to careful diagnostic evaluation, the preoperative preparation should include measures to combat any existing prothrombin, protein, hematologic or electrolyte deficiency. Avoidance of preoperative use of opiates and assurance of adequate oxygenation during anesthetization should be stressed.

A surgical team should be selected which can handle any contingency of exploration and correction. The surgeon must be prepared to explore the common duct at both extremes, to visualize the ampulla transduodenally, to perform biopsy and, if necessary, to do

pancreatograms, sphincterotomy or resect the pancreas. The secondary operation should be corrective if mechanically possible, for the risk of recurrent difficulty thereafter is too frequently catastrophic.

Removing from consideration the surgical issues and discounting or properly managing associated digestive diseases, especially the other two components of the triad, diverticulosis and hiatal hernia, we have the patient who is a temporary or permanent digestive cripple after being deprived of his gallbladder. These individuals have usually been dyspeptic by virtue of impaired function or disease of the gallbladder, a ductal system subjected to varying degrees of obstruction and associated inflammation or injury to biliary structures (liver and/or pancreas) and are now surgically discharged in the hope that their problem has been answered by a simple excision of a diseased organ. The problem is far from being that simple in a large proportion of the cases and requires the following medical measures:

The dietary program must be individualized to the hepatic, ductal, cholesterol and pancreatic status of the patient. In most instances a high carbohydrate, moderate protein, restricted fat (cooked) regimen will be satisfactory. Salt and protein should be restricted if hepatic failure threatens, and cholesterol intake should be further limited if hypercholesteremia is prominent. The possible value of inhibitors of cholesterol biosynthesis (MER-29) is suggested in our present studies. Obesity should be corrected. In the early postoperative period, in the face of dyskinesia or pancreatitis, frequent small feedings are indicated. The regularity of eating and the avoidance of between-meal feedings, however, become an essential to the re-establishment of dietary-desirable bile flow. If long periods of jaundice have depleted vitamin storage or impaired synthesis or absorption, these supplements should be added to the therapeutic program; deficiencies of the B complex group and hypoprothrombinemia should be considered.

The desirability of hydrocholeresis has been emphasized in our recent studies of choledochostomy patients. Bile flow and volume through the ductal system is increased by the production of a greater quantity of watery bile when dehydrocholic acid (Decholin®) or florantyrone (Zanchol®) are administered. The symptomatic and physiologic response noted justifies their administration, in all nonobstructive cases free of hepatic or pancreatic disease, to prevent or correct ductal stasis and the possibility of ascending cholangitis. Sodium dehydrocholate has the advantage of being innocuous when administered intravenously if parenteral administration is imperative.

Bile salts and bile acids should be additionally administered if

impaired fat absorption exists or is suspected. Associated pancreatic steatorrhea may justify the addition of sorbitan mono-oleate polyoxyethylene (Tween® 80), Pancreatin® or Steapsin.

Opiates that might excite dyskinesia are contraindicated, and nitrites should be given if dyssynergia becomes manifest. We have not been able to establish an antispasmodic action for any of the anticholinergics in relieving indicated sphincteric spasm; but the surgical observations of Rose (32, 33), Caroli (5) and Mallet-Guy (26) suggesting a vagal factor justify their use when hypertonic dyskinesia is theorized.

If the work of the same authors is substantial, the use of a cholecystokinetic agent will possibly relieve the hypotonic dyskinetics, and in such cases preparations like Probilagal® may be efficient. A trial is justified. Many of our patients have responded favorably, but there is no definitive proof of their action.

Beyond these measures the patient must understand the over-all requirements of adjusted habits and living to the degree of existing and persisting impairment of the biliary phase of digestion. Removal of the functioning gallbladder has disrupted a digestive component in which this reservoir emptied to assist in the digestion of foodstuffs when deposited into the duodenum. Further, a reciprocal mechanism in which the gallbladder contracted while the choledochal sphincter relaxed has been disturbed, with creation of a dysfunction, temporary or permanent, of this sphincteric mechanism. Physician's patience, patient reassurance and direction through this period of rehabilitation is essential to tolerance of minor dyspeptic difficulties or complete recovery therefrom.

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